Health Policy 115 (2014) 215–229

Contents lists available at ScienceDirect

Health Policy

journal homepage: www.elsevier.com/locate/healthpol

The effects of reimbursement mechanisms on medical technology diffusion in the hospital sector in the Italian NHS

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ARTICLE INFO

Article history:
Received 8 October 2012
Received in revised form
22 November 2013
Accepted 9 December 2013

Keywords:
Hospital care
Medical equipment
Prospective payment systems
DRG
Technology diffusion
Decentralization

ABSTRACT

Objectives: The aim of this study was to investigate how the differences across the regional reimbursement mechanisms and in particular the use of the DRGs impact on the level in the high technology equipment diffusion.
Methods: Based on hospital sector data at a regional level we build up indicators to measure the regional diffusion of high technological medical equipment in the period 1997–2007. These indicators are regressed on regional healthcare characteristics to investigate the relationship between the different reimbursement systems offered by Italian regions and the level of high technological medical equipment.
Results: Our results suggest that the per-case payment system is generally associated with a lower level of regional technology endowment per million of inhabitants, especially for the complex and expensive medical equipments.
Conclusions: Our findings cast some doubts that an effective regulation of reimbursement mechanisms cannot limit the excessive diffusion of medical equipment that is a relevant driver of the increase in expenditure.

1. Introduction

Current reimbursement schemes imply different incentives for health care organisations, among which there are the ones related to the medical technology, which represents one of the major drivers of costs and an increasingly important input in the production of health. Several empirical studies have investigated the links between the pattern of medical technology, particularly medical equipment, and a few relevant factors, among which reimbursement mechanisms [1–3]. Most of these studies, however, are focused on specific technologies and, therefore, they are inherently limited to investigate specific features of the reimbursement mechanisms for the services requiring the employment of those technologies [4]. In this paper, we aim at enlarging the scope of previous investigations by considering the impact of the main features of general reimbursement mechanisms (e.g. cost per case vs. fee for service) on the high technology equipment diffusion at regional level.

For this purpose, we investigate how the differences across the regional reimbursement mechanisms in Italian NHS affect the level of the medical high technology equipment. These differences mainly regard the extent of the use of the Diagnosis Related Group (DRG) system to finance hospital care. Hence, we contribute to the existing empirical literature by providing an econometric analysis of the relationship between the different reimbursement systems offered by Italian regions and the level of high technology medical equipment at an aggregate regional level in

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http://dx.doi.org/10.1016/j.healthpol.2013.12.004

the period 1997–2007, since data at hospital level are not available. Previous approaches proposed in the literature [7,26] would not be really useful with respect to the aggregate regional data we are using, which refer to a wide bundle of technologies and providers in the area. In fact, the endowment of high technology medical equipment at aggregate regional level is affected by factors different from those influencing the technology adoption of a single hospital such as geographical dimension and population of the region, its socio-economic and health conditions, public–private mix and regulation of health care providers. Thus, to measure the technology endowment at regional level, we use aggregate indices of technology computed per millions of inhabitants and based on a weighted sum of the number of different pieces of equipment, where a vector of estimated normalised prices represents the weights.

Our results suggest, given the available dataset, that the per-case payment system is generally associated with a lower level of regional technology endowment per million of inhabitants, when controlling for variables related to demand and supply of hospital services. This effect is particularly relevant in the case of the most expensive medical equipment technology.

The paper is organised as follows: Section 2 reviews the main findings of the literature and briefly presents the Italian institutional framework, Section 3 describes our data set and develops the empirical analysis and Section 4 discusses our empirical results. Finally, Section 5 offers some concluding remarks and policy implications.

2. Background

2.1. Medical technology diffusion and measurement issues

Several studies show that medical technology[1] is one of the most relevant drivers of the increase of public expenditures on health [5]. A broad definition of medical technology is frequent in studies on non-price competition that refer to both old processes and newly developed devices. Differently, the stream of research known as "medical arms race" focuses only on newly developed, expensive devices and processes [7], whereas other works investigate the factors affecting the rate of diffusion of new medical technologies [8].

The empirical literature connects health care expenditure and medical technology to explain the process of adoption of medical technology, considering several factors such as the degree of substitutability/complementarity between old and new technologies, the level of effort reduction and output improvement of medical innovation, the role of the costs of technological adoption in accordance with treatment expansion and substitution, the characteristics of the health care system, its financing and regulation [4]. Among these factors, we focus on the effects of different reimbursement systems on the decisions of health care providers to adopt new technologies. In particular, under retrospective cost reimbursement system hospitals run no financial risk of investment in technology and, thus, this payment system leads to the "medical arms race", i.e. escalation of health care costs due to proliferation of expensive medical technology and devices [7].[2]

In a prospective payment system, such as the DRG one, hospitals are encouraged to keep their average costs below the payment rate in order to avoid making a loss and, thus, affecting technology adoption [25,46].

The effects of these incentives on the hospitals' adoption of technological innovations strictly depend on the country-specific institutional characteristics and on the kind of perspective payment system in use [24]. For instance, fixed global-budget schemes do not seem to foster technology adoption [20], whereas DRG based systems may favour the purchase of innovative technologies if they can reduce admission costs [7]. Moreover, it has to be considered that, in practice, the "pure" perspective model is hardly implemented since each country makes adjustments (see, for some European countries [47]).

From a theoretical perspective, the link between technology adoption and health insurance market [9,10] and the connection between technology diffusion and reimbursement systems in an "ex-post" moral hazard framework [11] have been studied. Also, attention has been paid to the impact of different payment systems on the adoption of endogenously provided new technologies [12] and to the optimal investment decision mechanism in new health care technologies of hospitals [13].

Empirical studies on US [14,15] and Japanese hospitals [16] have shown that low prospective payment rates negatively affect the adoption of technologies, particularly cost-increasing ones, though the extent of this varies from case to case. In addition, a positive association between the degree of competition in the health care market and the propensity to adopt new technologies has been reported [17]. Looking across countries, the differences in technology diffusion can be explained by the different regulatory policies and payment systems to providers [18,19]. The financing of capital costs differs among countries. For instance [47], classify 11 European countries according to whether capital costs are financed via DRG or via specific budget lines and show no clear prevalence of one scheme (e.g. in Italy a mixed scheme is adopted [48]).[3]

From a more general perspective, decision-makers often choose technologies that are not necessarily the most effective or cost-effective ones, due to budgetary constraints and to the lack of detailed information on the effectiveness and costs of new medical services [6]. This is, indeed, the case for a strong contrast between doctors, asking for the most effective technologies regardless of their costs,

[1] The OECD [6] lists the characteristics of medical technological change capable to have economic consequences: whether the new technology substitutes for old or is add-on to existing one; whether the new technology causes average cost reduction, quality improvement or reduction of risk to patients.

[2] For a general discussion on the incentives in regulation mechanisms, see [45].

[3] Six countries fund capital costs exclusively through the DRG system (Austria, UK, Estonia, Finland, Netherlands, Switzerland and Sweden). Five use only separate payments (Catalonia/Spain, Germany, Ireland, Portugal). Finally, two use both (France and Poland).